

## Introduction to Engineering

### Course Code: 21001

#### **Rationale Statement:**

The Introduction to Engineering course is designed to provide a foundation in engineering for students in South Dakota. Students are engaged in an instructional program that integrates academics and technical preparation and focuses on career awareness. This course will prepare students for advanced educational opportunities.

#### **Suggested Grade Level: 9-12**

#### **Topics covered:**

- Exploring the field of engineering
- Materials and processes used in engineering
- Systems used in engineering
- Effective communication

<b>Indicator #1: Explore the fields of engineering</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
<b>Analyzing</b>	<b>IE.1.1 Examine the evolution of engineering</b>  Examples: <ul style="list-style-type: none"> <li>• Analyze the influence of engineering on history</li> <li>• Compare and contrast two different fields of engineering</li> <li>• Develop a time line of major engineering developments</li> </ul>
<b>Understanding</b>	<b>IE.1.2 Identify the types of engineers.</b>  Examples: <ul style="list-style-type: none"> <li>• Develop a job description of an engineer</li> <li>• Describe the work of different types of engineers</li> <li>• Participate in a field trip observing the activities of an engineer</li> </ul>
<b>Understanding</b>	<b>IE.1.3 Describe the engineering team.</b>  Examples: <ul style="list-style-type: none"> <li>• Describe the duties of the members of the engineering team</li> <li>• Identify the proper sequence of duties, as they relate to the engineering team</li> <li>• State the proper sequence of duties, as they relate to the engineering team</li> </ul>

<b>Indicator #2: Investigate various engineering systems</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standards and Examples</b>
<b>Understanding</b>	<b>IE.2.1 Identify the various types of engineering systems</b>  Examples: <ul style="list-style-type: none"> <li>• Define each engineering system and give an example for each</li> <li>• Match engineering systems to common processes</li> <li>• List the components of an engineering system</li> </ul>
<b>Applying</b>	<b>IE.2.2 Apply engineering systems to solve problems</b>  Examples: <ul style="list-style-type: none"> <li>• Construct circuits from a schematic diagram</li> <li>• Assemble a mechanical system from visual or written instructions</li> <li>• Build a device to control the temperature in an enclosure</li> </ul>

<b>Indicator #3: Apply the engineering process to a product</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standards and Examples</b>
<b>Applying</b>	<b>IE.3.1 Design a product</b> Examples: <ul style="list-style-type: none"> <li>• Generate thumbnail sketches to create ideas</li> <li>• Prepare a three view orthographic projection of a design</li> <li>• Create a design of a doghouse using CAD</li> </ul>
<b>Applying</b>	<b>IE.3.2 Construct a 3-D model</b> Examples: <ul style="list-style-type: none"> <li>• Build a scale model</li> <li>• Use a 3-D printer to explore form, function, and feel</li> <li>• Construct a 3-D floor plan</li> </ul>
<b>Applying</b>	<b>IE.3.3 Build and test a prototype</b> Examples: <ul style="list-style-type: none"> <li>• Expose and use the prototype in real-world conditions</li> <li>• Conduct a feasibility study on the prototype</li> <li>• Collect data generated from testing the prototype</li> </ul>
<b>Applying</b>	<b>IE.3.4 Develop a system to produce a final product</b> Examples: <ul style="list-style-type: none"> <li>• Design an assembly line that would effectively and efficiently produce a final product</li> <li>• Create a process that would allow for product development</li> <li>• Create a flow chart demonstrating the product development process</li> </ul>

<b>Indicator #4: Demonstrate effective communication</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standards and Examples</b>
<b>Applying</b>	<p><b>IE.4.1 Demonstrate effective oral communication</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Present a speech that addresses environmental issues related to engineering</li> <li>• Effectively communicate with group members to brainstorm while solving a problem</li> <li>• Communicate the importance of each step in the engineering design process through an oral presentation</li> </ul>
<b>Applying</b>	<p><b>IE.4.2 Demonstrate effective written communication</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Write a report summarizing how an engineering system works</li> <li>• Create a set of directions to assemble a product</li> <li>• Research and write a newspaper editorial stating your view on a controversial engineering issue</li> </ul>
<b>Applying</b>	<p><b>IE.4.3 Demonstrate effective graphic communication</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Use PowerPoint to present an idea for a product to the class</li> <li>• Design and publish documents using advanced publishing software and graphic programs</li> <li>• Present prototype data to the class using charts and graphs</li> </ul>

<b>Indicator #5: Examine materials and testing procedures used in engineering</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standards and Examples</b>
<b>Analyzing</b>	<b>IE.5.1 Analyze materials based on their properties</b> Examples: <ul style="list-style-type: none"> <li>• Compare and contrast materials used in engineering</li> <li>• Evaluate availability of materials</li> <li>• Assess cost of materials</li> </ul>
<b>Analyzing</b>	<b>IE.5.2 Analyze material testing procedures</b> Examples: <ul style="list-style-type: none"> <li>• Examine the physical factors of the material(s)</li> <li>• Compare the cost factor(s) for various testing processes</li> <li>• Perform Brinell Hardness test on materials</li> </ul>